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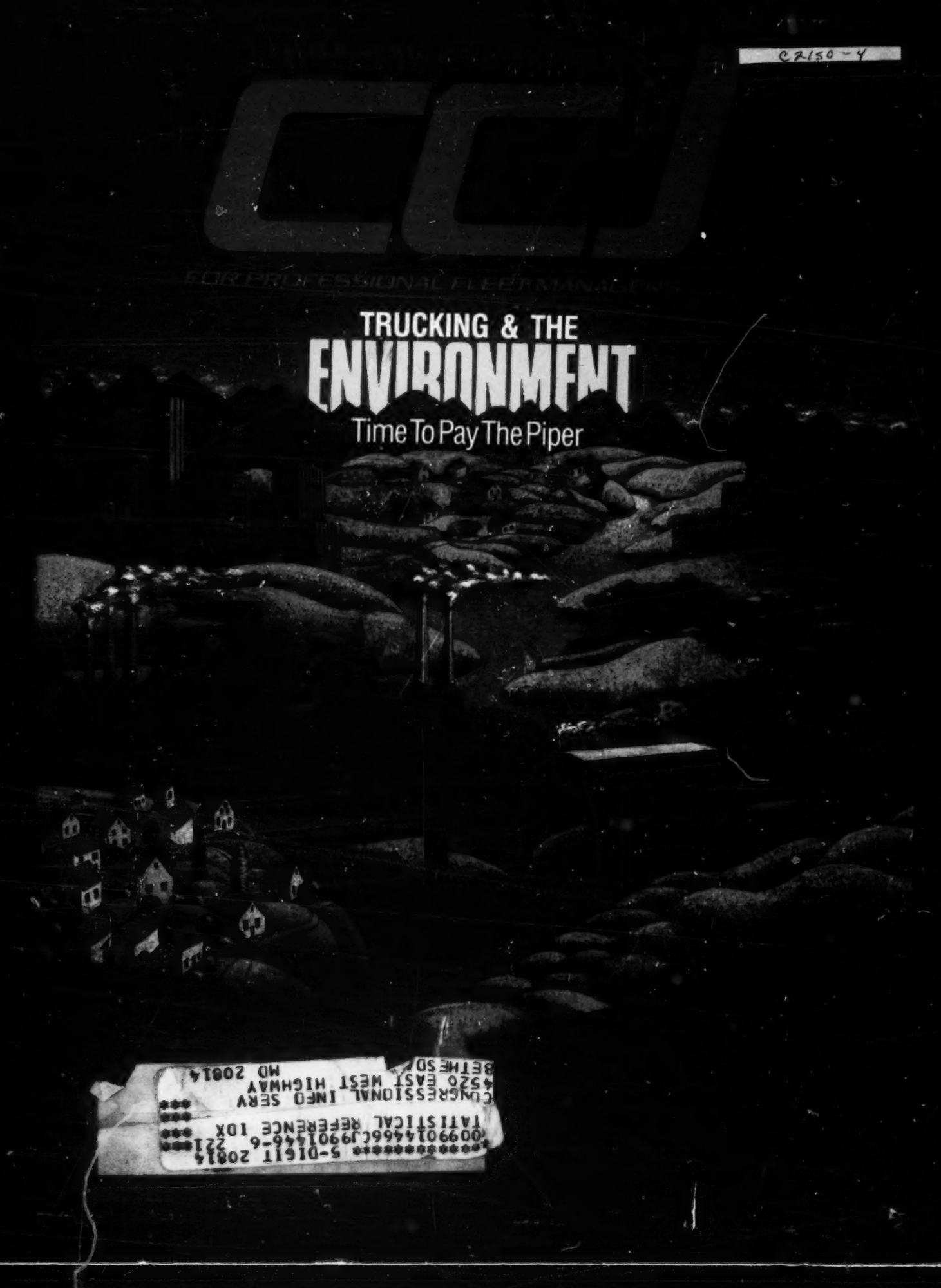
FOR PROFESSIONAL FLEET MANAGERS

TRUCKING & THE ENVIRONMENT

Time To Pay The Piper



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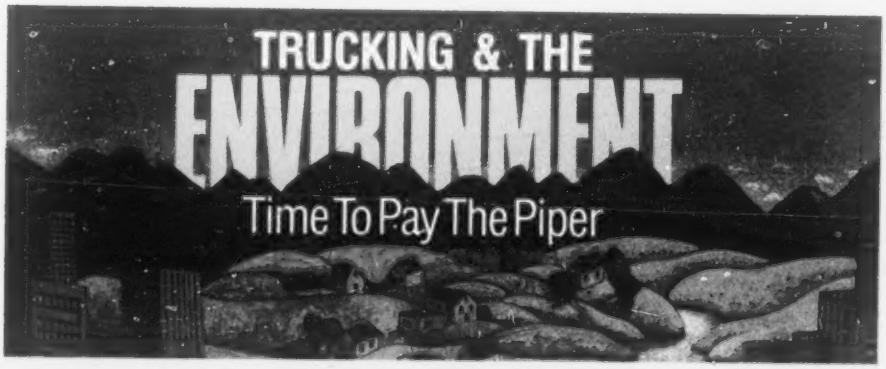

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IN THE NEXT ISSUE

In addition to providing updated information on reciprocity, registration, sizes and weights, permits and taxes, and access restrictions that's always in the Fleet Reference Annual section, the April issue will include a special article on leasing.

It will describe how corporations use leasing to solve new problems that have assaulted the over-capacitated, more complicated trucking environment. The article will discuss:

- How capital leasing allows corporations to scale down assets and minimize AMT tax liability.
- How full-service lessors solve problems such as finding qualified drivers and mechanics, replacing leaking underground storage tanks, disposing of used oil, solvents, batteries and tires. □

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Employee training: Major firms focus on basic skills

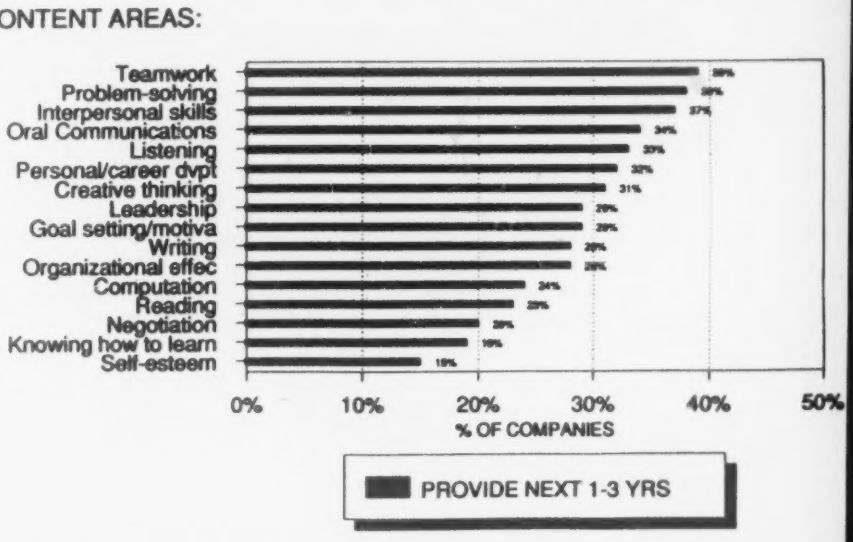
Truckers aren't the only American business people who have to cope with unskilled employees and under-trained job candidates. That's why more than 90% of the nation's largest companies will be providing training in basic workplace skills within the next three years.

That determination is based on a recent survey conducted by the American Society for Training and Development, Alexandria, Va.

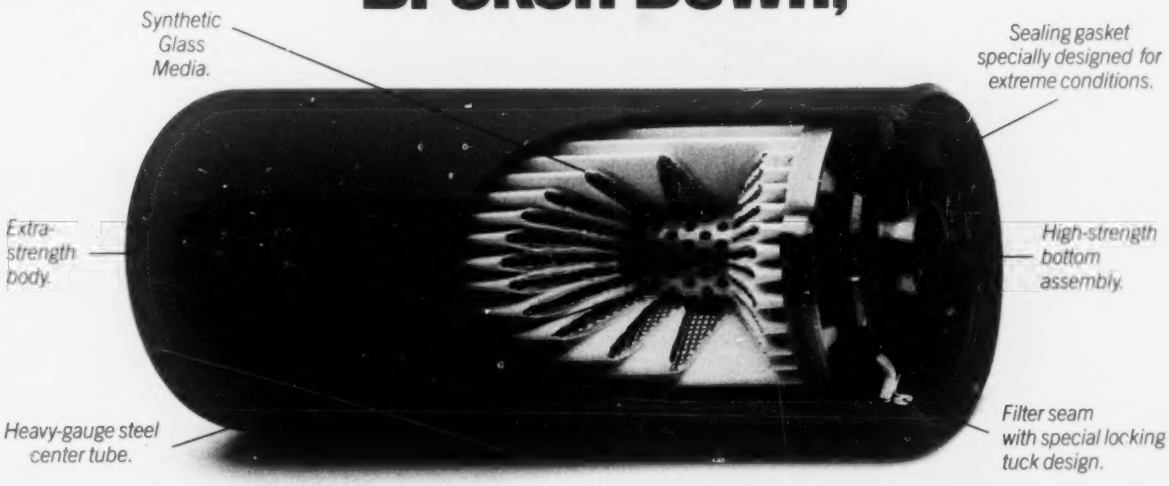
Using the 13 "necessary basic skills in addition to reading, writing and computation," established in an earlier ASTD study, the survey of 200 human resource executives from *Fortune 500* corporations, companies and major private firms also found that:

• 73% already provide some type

Ranking Of Skills To Be Taught Hourly Employees



We Thought You'd Rather See This Broken Down,


Synthetic Glass Media.
Sealing gasket specially designed for extreme conditions.
Extra-strength body.
High-strength bottom assembly.
Heavy-gauge steel center tube.
Filter seam with special locking tuck design.

If you run your fleet in the most grueling environmental conditions, then take a good, hard look at our new heavy duty oil filter with Synthetic Glass Media (SGM) – a specially designed four-layer filtration medium for superior performance under extreme conditions.

What you'll see is a filter that can remove up to 10 times more small, engine-damaging wear par-

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of basic skills training for hourly and nonsupervisory employees;
• 54% of the companies surveyed said they offer basic skill training to new employees, and 16% said they plan to provide it in the future.

Basic skills receiving the most attention, according to ASTD, are problem-solving (58%), teamwork (51%), interpersonal skills (48%), oral communication (45%) and listening (43%).

Some of survey respondents also are teaching academic subjects such as: writing (41%), computation (31%) and reading (22%).

The reasons why the training is being offered are: to upgrade the work skills of current employees (68%), changes in work processes (58%), and changes in technology (56%). □

Hub Group challenges J.B. Hunt's joint marketing venture with railroad

It was noted in the news section of the February issue of CCJ that the Atchison, Topeka and Santa Fe Railway and J.B. Hunt Transport announced plans for a joint intermodal program called Quantum service. Hunt solicits and picks up freight in the Midwest, then delivers it to Santa Fe for a rail move to the West Coast. The Lowell, Ark.-based truckload carrier then reclaims the freight and makes the final delivery.

Now the Hub Group is making tracks to "compete directly" with the Santa Fe/Hunt venture, according to Phillip Yeager, Hub's chairman.

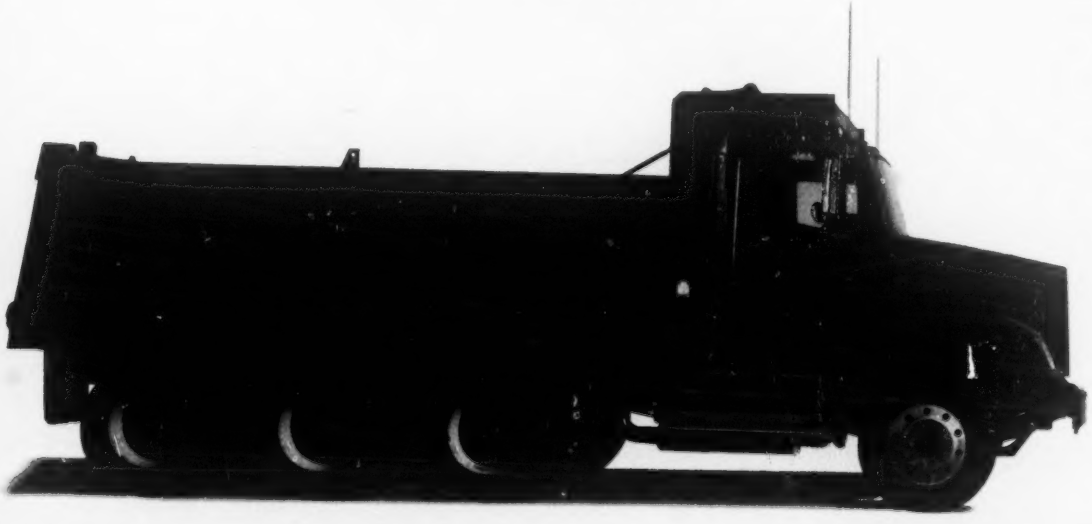
The Hub Group says its competing intermodal service will "take as much business off the highways as Hunt, but with lower costs and superior service."

Yeager noted that the service is called Bantum because Hub is smaller than Hunt and because "the nation's largest independent shipper agent," has the "ability to work more closely with customers."

The competing door-to-door services will be similar—third morning delivery of 48-ft-long units to Los Angeles from Detroit and Chicago via Santa Fe.

However, the guaranteed Bantum operation also includes:
• a $200 penalty if Hub doesn't meet delivery requirements;
• a $200 savings can be realized when freight is moved on another railroad—via one of API's double stack trains—and the transit time is four hours longer than the regular Bantum option. The alternative also includes a $200 delivery guarantee. □

Than This.



ticles while providing less resistance to oil flow than conventional filters. The result is a filter that gives the owners of every major fleet the extra protection they need.

The new Wearguard HD oil filter with SGM. It's at its best when conditions are at their worst.

Introducing Fram Wearguard HD Oil Filter With SGM

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ENFORCEMENT: THE HEAT IS ON

No trucking executive has spent time in jail for an environmental crime, but corporate executives in other businesses, who failed to take new enforcement efforts seriously, have looked back on their indiscretions through iron bars. Clearly, enforcement targeted at individuals is on the rise, and not just at the federal level.

It was the first case linking an environmental criminal violation with knowing failure to perform preventive maintenance. It was the second environmental case in which a company was convicted of criminal negligence for improperly managing lower-level conduct. By trial's end, the case would claim an additional first.

On May 20, 1988, a federal grand jury indicted Pennwalt Corp., one of the nation's largest chemical companies, and four of its corporate officials on charges of polluting a waterway with hazardous chemicals.

Despite an apparent ability to have fixed a known structural weakness of a holding tank, officials failed to prevent a 1985 spill of approximately 75,000 gallons of a highly toxic and potentially cancer-causing liquid into a waterway from the ruptured tank. According to one court document, the tank was corroded so badly that one worker said it resembled cancer on a car fender, reported *The New York Times,* July 1989. The government also accused the company of trying to hide the spill from state inspectors and lying to the Coast Guard about what was spilled.

The four officials, employed by the Philadelphia-based corporation, were indicted on six criminal violations. The company faced fines up to $1 million, and individuals faced jail sentences up to nine years.

In a plea agreement with the government, Pennwalt Corp. agreed to pay $1.1 million in exchange for criminal charges being dropped against corporate officials. The plea was accepted August 9, 1989, but only after U.S. District Court Judge Jack Tanner, in June, called for corporate accountability, reported *The Times.* "I want the top officer here," said Judge Tanner.

Continued

EPA CRIMINAL ENFORCEMENT FY1982 to FY1988

	FY82	FY83	FY84	FY85	FY86	FY87	FY88
Referrals to DOJ	20	26	31	40	41	41	59
Cases successfully prosecuted	7	12	14	15	26	27	24
Defendants charged	14	34	36	40	98	66	97
Defendants convicted	11	28	26	40	66	58	50
Months sentenced			6	78	279	456	278
Months served			6	44	203	100	185
Months probation		534	552	882	828	1410	1284

Source: EPA Office of Enforcement and Compliance Monitoring

Though Pennwalt officials managed to escape hard time, have no doubt that the heat is on. Judge Tanner's insistence on accountability by the highest official was a precedent setting action. Law professionals are confident the trend toward hardball will pick up speed in the 1990s.

The numbers

Since 1899, when the first pollution control act (Rivers and Harbors Act) was enacted, until 1981, approximately 15 environmental crimes were prosecuted, says Government Institutes Inc., a specialist in environmental education. That's less than two per decade. By comparison, 1989 hosted 101 indictments and 107 guilty pleas and convictions, according to the Department of Justice.

Everyone seems to be hopping on the environmental bandwagon. In the decade ahead, criminal prosecution of environmental crime will become ever more prominent, said Jay Manning, assistant attorney general-hazardous waste department, in Seattle, Wash. Right now, it's a novelty to most judges, Manning said.

Still, the Environmental Crimes Section of the Department of Justice (DOJ) has statistics demonstrating an increased effort in dealing with environmental violations. Currently, 25 full-time attorneys are on staff to handle the cases. From 1983 through 1989, the DOJ recorded indictments against 569 corporations and individuals. From those, 432 pleas and convictions have been recorded and $26,094,108 in federal fines assessed. More than 271 years of jail time have been imposed, with approximately 102 years of that time served by the end of 1989. For a breakdown on these numbers, see the accompanying chart.

According to Tom Samoluk, a spokesman for Scott Harshbarger, a Massachusetts district attorney and president of the Massachusetts District Attorneys Assn., jail time for environmental crime is given to the extreme offenders. Prosecutors are not out to get the person who makes a mistake, said Samoluk. Typically, cases involve long-term abuses, he added, and people with a blatant disregard for the laws and even others' lives.

For example, Manning tells of a New York case involving a manufacturer of illegal drugs. Chemicals used in the process were stored in a shed which one day caught fire.

If the shed had blown up, the explosion would have been devastating, explained Manning. Drug maker Carlos Gomez was found in violation of the Resource Conservation and Recovery Act and convicted of knowing endangerment. Gomez is serving 10 years in jail. The sentence, handed down July 17, 1989, is the most severe to date, said Manning. For statistics on criminal enforcement of environmental crime, see the accompanying chart.

What the feds want

Federal and state laws allow for both civil and criminal enforcement of the environmental statutes highlighted below. Though several still carry just civil maximal penalties, meaning a sentence of no more than one year in jail, Manning said nothing's more effective than criminal enforcement. Thus government at all levels will act to stiffen penalties in the 1990s, he adds. Statutes regulating the environment which the trucking industry should be familiar with are listed below. Sources for this information were EPA's Office of Enforcement and Compliance Monitoring and the Environmental Health Center, a division of the not-for-profit, nongovernmental National Safety Council. Both sources are located in Washington, D.C. Also consulted was Government Institutes Inc. (see additional sources at report's end).

• **Resource Conservation and Recovery Act (RCRA):**

Established in 1976 to govern storage, transportation, treatment and disposal of hazardous waste. Followup Acts under RCRA are Hazardous Materials Transportation Act (HMTA) and Emergency Planning and Community Right to Know Act (EPCRA). HMTA concerns registering and placarding hazardous materials. Under the EPCRA, extremely hazardous materials (of which 366 exist), if released in the environment, must be reported immediately to state and local authorities responsible for emergency planning.

Amendments in 1984 to RCRA tripled the maximum penalty for individual violations from five to 15 years in prison and/or up to $250,000 in fines for knowing endangerment, which is creation of a risk of harm. An organization may be fined up to $1 million.

RCRA allows penalties of up to five years' imprisonment and/or a $50,000 fine for each day of violation, to be imposed against any person who is convicted of the following:

1. Knowingly transporting or causing to be transported any hazardous waste or used oil to an unpermitted facility.

2. Knowing treatment, storage or disposal of hazardous waste or used oil (a.) without a permit; (b.) in knowing violation of permit condition; or (c.) in knowing violation of interim status standards.

Penalties of up to two years' imprisonment and/or a $50,000 fine are allowed for each day of violation for persons who commit the following:

1. Knowingly omitting material information or making false statements in documents required for compliance with RCRA.

2. Knowing destruction, alteration, concealment or failure to file records required for compliance with RCRA.

3. Knowingly transporting or causing to be transported hazardous waste or used oil without a manifest.

4. Knowing export of hazardous waste without compliance with export procedures.

A second conviction doubles the maximum sentence available under any provision.

• Comprehensive Environmental Response, Compensation and Liability Act (CERCLA):

Commonly referred to as Superfund (CERCLA) was enacted in 1980 to facilitate the cleanup of the nation's worst hazardous waste sites. In addition to liability for the expense of cleaning up the site, liability also may include the cost of providing alternative water supplies and damages for restoring natural resources.

Strict liability standards make past and present users of a site responsible for that site. Also liable are generators of waste that was sent to the site.

It is not a defense that the generator exercised due care in arranging disposal or that the disposal facility complied with all applicable environmental and safety requirements. Only three defenses exist: release of hazardous substances caused by an act of war, an act of God, or an act or omission of a third-party who is not directly or indirectly involved in a contractual relationship with the defendant.

Where harm is indivisible, a single generator of hazardous substances may be forced to pay the entire cost of cleaning up the site if other companies involved have since become insolvent. This holds true even if the majority of hazardous substances has been sent to the site by other generators. Important to note is the Act's purpose to reach past conduct, including conduct occurring prior to CERCLA's enactment.

Citizens and/or employees who report a crime to EPA under CERCLA may receive a $10,000 reward if the tip is the first received; concerns a serious offense that would not have been discovered by EPA; the reporter is willing to testify, and the pollutor is convicted.

• Clean Water Act (CWA):

This is the water statute most often used by prosecutors. Others you may encounter are Marine Protection, Research and Sanctuaries Act (MPRSA), Rivers and Harbors Appropriations Act of 1899 and Safe Drinking Water Act (SDWA). All offer penalties to persons who illegally discharge pollutants or hazardous substances into waterways. Anyone blatantly disregarding the regulations can reasonably expect more than a slap. Under CWA, up to five years in jail and/or a fine of $50,000 a day is allowed.

Additionally, under this Act, the EPA may assure that the Federal Government does not do business (engage in grants, contracts or loans) with facilities that have demonstrated a pattern of noncompliance with CWA.

In terms of civil penalties, meaning fines only, the Clean Water Act

Continued

DEPT OF JUSTICE ENFORCEMENT RESULTS

This chart shows the results of increased enforcement efforts by the U.S. Dept. of Justice. Fines, jail sentences and actual time served for environmental criminals have each risen dramatically during the past seven years.

	Fines imposed/$	Jail terms	Actual confinement
FY83	341,100	11 yrs.	5 yrs.
FY84	384,290	5 yrs. 3 mos.	1 yr. 7 mos.
FY85	565,850	5 yrs. 5 mos.	2 yrs. 11 mos.
FY86	1,917,602	124 yrs. 2 mos. 2 days	31 yrs. 4 mos. 12 days
FY87	3,046,060	32 yrs. 4 mos. 7 days	14 yrs. 9 mos. 22 days
FY88	7,091,876	39 yrs. 3 mos. 1 day	8 yrs. 3 mos. 7 days
FY89	12,747,330	51 yrs. 25 mos.	36 yrs. 14 mos.
TOTAL	26,094,108	267 yrs. 44 mos. 10 days (270 yrs. 8 mos. 10 days)	97 yrs. 58 mos. 41 days (101 yrs. 11 mos. 5 days

Source: U.S. Dept. of Justice, Environmental Crimes Section

Fines, prison sentences for violators

Prison for illegal storage

On October 28, 1988, Kasema Mackenzie, owner of Washington Environment Pro-Tech Inc., pled guilty to one count of illegally storing hazardous waste, in violation of RCRA. Mackenzie had stored 300 55-gal drums, containing hazardous waste, in a mini-storage complex.

Mackenzie was ordered to pay $100,000 restitution for clean up costs that were incurred by the EPA. He was sentenced to six months' imprisonment, 30 months' suspended sentence and three years' probation.

(Case briefing courtesy of EPA's National Enforcement Investigations Center, Denver, Colo.)

No permit gets stiff fine

Riecel International Inc., parent company of the ready-mix concrete plant Pioneer Construction Materials Co., Seattle, Wash., was charged with six counts of negligently discharging waste water into a navigable water of the United States without the necessary permit, violating the Clean Water Act. James Repman, president of Pioneer, and Ronald Summers, operations manager at Pioneer, were charged with two counts each of negligence in violation of CWA.

Riedel International was sentenced on December 2, 1988, to pay a $150,000 fine, plus a $150 assessment to the Crime Victims Fund. Repman was fined $10,000 and must serve three years' probation and perform 150 hours of community service. Summers was ordered to pay a $3,000 fine, serve five days' imprisonment, three years' probation and perform 150 hours of community service.

(Case briefing courtesy of EPA's National Enforcement Investigations Center, Denver, Colo.)

Jailed for polluting

In a stationary source Clean Air Act case settled in October 1988, four managers of demolition for Great Neck, N.Y.-based Cuyahoga Wrecking Co. were sentenced to prison.

Lengths of sentences ranged from two months to 18 months. Defendants were charged with conspiracy to defraud the U.S. EPA and demolish buildings and structures in violation of emission standards for asbestos, failure to immediately notify the appropriate U.S. Government agency of the release of a reportable quantity of asbestos, and other charges related to the release of asbestos into the air.

The company was ordered to pay a $250,000 fine.

(Case briefing courtesy of EPA's National Enforcement Investigations Center, Denver, Colo.)

in 1988 resulted in the greatest amount of fines, 34%, against individuals and corporations.

• **Clean Air Act (CAA):**

EPA established air quality standards for six air pollutants regulated under the CAA. These are carbon monoxide, lead, nitrogen dioxide, ozone, particulate matter and sulfur dioxide. This Act has provisions for both mobile and stationary sources of clean air violators.

Currently, under federal law, this Act carries misdemeanor maximal penalties, meaning no more than a one-year jail sentence is allowed.

Additionally, under this Act, the EPA may assure that the Federal Government does not do business (engage in grants, contracts or loans) with facilities that have demonstrated a pattern of noncompliance with CAA.

This is a popular Act among prosecutors. In 1988, it accounted for the second largest number of cases under any environmental Act and second largest amount of fines.

• **Toxic Substances Control Act (TSCA):**

Controls toxic substances entered into the interstate market and registration of intent to distribute. It carries federal misdemeanor maximal penalties, meaning no more than a one-year prison sentence allowed, except for disclosure of confidential information, which is considered a felony.

In 1988, TSCA claimed the greatest number of environmental cases, says EPA's Alderson.

• **Federal Insecticide, Fungicide and Rodenticide Act (FIFRA):**

This Act regulates registration and tolerance levels of pesticides.

As penalties take on more force, prosecution and jail time will become more prominent.

It carries federal misdemeanor maximal penalties, meaning no more than a one-year prison sentence allowed, except for disclosure of confidential information, which is considered a felony.

What's happening locally

At a National District Attorneys Assn. conference, held July 17, 1989, in Maine, Scott Harshbarger, D.A. of Middlesex County, Mass., called for District Attorneys across the nation to get involved in environmental crime. Harshbarger urged the group to get local law enforcement involved in the effort by providing them with education. The rally paid off, said Tom Samoluk, Harshbarger's spokesman. Numerous prosecutors wanted copies of the speech; D.A.s in Chicago, Denver and Los Angeles already are actively pursuing environmental cases.

In Middlesex County, the District Attorney's office energizes local law enforcement, including fire officials and conservation groups, by bringing the group together for a day-long comprehensive seminar. Environmental laws are reviewed, plus how to recognize violators, investigate the crimes and utilize resources, said Samoluk. The Massachusetts office even produced a manual to assist the education process. And they are having trouble keeping the manual in stock, he added.

"We encourage [local law enforcement] to get the District Attorneys' office involved as soon as possible," said Samoluk. A case demonstrating teamwork currently is being investigated by Samoluk's office.

State police, working with the District Attorneys office, "were put on surveillance and caught five 18-wheelers, carrying tons of debris, [illegally] dumping at a site," stated Samoluk. The material being dumped was not thought to be hazardous.

Samoluk lists as a roadblock to prosecution a lack of reports on abuses from public or local officials.

Another stumbling block is lack of manpower and resources, which, Samoluk said, always will be a hindrance in pinpointing environmental violators.

Currently, state governments are working to toughen up laws, said Samoluk. For example, in 1987, Massachusetts law regulating penalties for illegal dumping was amended to allow jail time. As the penalties begin taking on more force, prosecution and jail time will become more prominent, he said.

Minimize your liability

OSHA offers a free consultation service for employers who would like help pinpointing trouble spots in the workplace. The service provides the following: helps workers recognize hazards; suggests options for solving safety/health problems; identifies source of help available. The comprehensive consultation also will include an appraisal of mechanical and environmental hazards; appraisal of present job safety and health program; a conference with management on the findings; a written report of recommendations and agreements; and, training and assistance with implementing recommendations.

Problems found by the service, operated independently of OSHA, often don't cost money to correct, said William B. Hoffman, a consultant with West Virginia's Safety and Health Department of Labor, which performs the service in that state. Sometimes the hazard is just a maintenance problem and can be fixed in-house.

Consultants will suggest effective ways to eliminate the problem; they are not allowed to report problems to OSHA.

However, if a problem found is an imminent danger and the employer does not act immediately to eliminate it, the inspector may report the problem to OSHA, said Hoffman. If a company checks out okay following an inspection by the free service, it may apply for a one-year exemption from a random inspection by OSHA, he added.

For more information

- *"Getting Tough on Environmental Crime,"* Resources, *October 1989, The ERM Group, 855 Springdale Drive, Exton, Pa. 19341; 800-544-3117.*
- *"Used Oil: Disposal Options, Management Practices and Potential Liability," Second Edition, c. March 1989, Government Institutes Inc., 966 Hungerford Dr., #24, Rockville, Md. 20850. 301-251-9250.*
- *"FY 1988 Enforcement Accomplishments Report", United States Environmental Protection Agency, Office of Enforcement and Compliance Monitoring, Washington D.C. 20460.*
- *"Consultation Services for the Employer," available free from the Occupational Safety & Health Administration. Contact your local OSHA office listed in the phone directory under government agencies.*
- *"Prosecuting Environmental Crimes," by Scott Harshbarger, District Attorney of Middlesex County, Mass., and president of the Massachusetts District Attorneys Association, published by* Vital Speeches of the Day, *City News Publishing Co., 389 Highway 17 Bypass, Box 1247, Mt. Pleasant, S.C. 29465. 803-881-8733.* □

REGIONAL AND LOCAL STAKES IN EMISSIONS

The states are not sitting back and waiting for the federal government to tell them what to do about vehicle emissions. They're taking the initiative by enacting their own emissions controls, more stringent than federal requirements.

The impetus for such action is many states' inability to meet federal air quality standards without the stricter controls and the slowness of the federal government to move on the Clean Air Act amendments.

The Environmental Protection Agency (EPA) reported in July 1989, that 101 areas, most of which are major metropolitan areas, experienced ozone levels during 1988 that exceeded the federal air quality standard for ozone.

Southern California, in particular, has some of the worst air in the country. The region's ozone levels are three times higher than the acceptable national health standard, the carbon monoxide levels are twice the federal standard, and levels of particulate matter in the air are 80% above the federal standard. The Southern California basin remains the only region that still violates national nitrogen dioxide standards.

The South Coast Air Quality Management District reports that air pollutants exceed acceptable levels about 200 days a year.

Furthermore, the region's bad air reportedly costs an estimated $13 billion annually in health effects, $7 million in crop damage, $57 million in damage to materials and $275 million in "visibility degradation."

EPA is exerting strong pressure on Los Angeles to take corrective action, and various agencies are scrambling to come up with solutions to prevent fines and a possible loss of federal funds. Already EPA has withheld sewer funds from Los Angeles because of the area's poor air quality, according to Karen Rasmussen, director of governmental and industry affairs for the California Trucking Assn.

The efforts of those agencies have resulted in the Air Quality Management Plan (AQMP), which serves as a framework for all pollution control efforts in the South Coast Air Basin. The ultimate goal of the plan is to reduce emissions to the point where all the federal air

Continued

At least 12 states and numerous local municipalities have stopped waiting for the federal government to deal with serious environmental threats believed to result from vehicle emissions. The anticipated impact of regional and local initiatives on motor carriers includes cost raising items like restrictions on operating hours, special permit fees, alternative and dual-fuel fleets and en route delays for vehicle emissions inspections.

Los Angeles mayor Tom Bradley has proposed to limit truck traffic on city streets during peak commuting periods.

quality standards are met by the year 2007. To accomplish that goal, the plan encompasses more than 100 rules designed, among other things, to clamp down on emissions, encourage change in commuter habits and set guidelines for cities as they plan the use of land to minimize pollution.

Following is a description of the South Coast Air Quality Management District's three-tier plan for improving air quality in the South Coast Air Basin:

Tier I:

Tier I includes about 120 control measures that can be adopted within the next five years using currently available technological applications and management practices.

Some of the 39 measures affecting the automotive industry include: lowering emissions test standards for new cars to 0.25 grams of hydrocarbon (from 0.39), 3.7 grams of carbon monoxide (from 7), 0.4 grams of nitrous oxide (from 0.7) per mile driven; lowering emissions limits for diesel-powered vehicles; requiring fleets with more than 15 vehicles to replace scrapped vehicles with methanol-powered vehicles.

All the Tier I control measures are expected to be adopted by the appropriate implementing agency by 1993. Full implementation of some measures will not occur until 2007.

Tier II:

Tier II measures include already-demonstrated control technologies and technological advancements expected to occur in the near future. The goal for Tier II is to achieve 40% use of low emitting passenger vehicles; 70% use of low emitting freight vehicles; 100% use of low emitting transit buses.

"Low emitting" refers to all emission control technologies, as well as all fuels, that, on an equal Btu basis, produce lower levels of reactive organic gases, NOx, CO and PM emissions compared to conventional fuels and are at least as clean as methanol.

All the Tier II goals are expected to be achieved by the year 2000 except for transportation facility construction, which may continue until the year 2007.

Tier III:

Tier III requires commitments to research, development and widespread commercial application of technological advancements that may not exist yet. Some 95% of cars would be powered by fuels other than gasoline by 2007. Those vehicles would be essentially emission-free, probably through the development of electric-powered vehicles.

Each proposal in the plan must go through a rulemaking and public hearing process that would require months to complete. However, some of the measures could become law by the early 1990s, although they might not become effective until years later.

Other ways to improve air quality

In addition to the AQMP, the Southern California region is attempting air quality improvements through other means. For example, Los Angeles mayor Tom Bradley has proposed to limit truck traffic on city streets during peak commuting periods – between 6:00 a.m. and 9:00 a.m. and from 4:00 p.m. to 7:00 p.m. No tractor-semitrailers and three-axle straight trucks weighing 26,000 lb or more would be allowed to operate during those periods unless their owners purchase exemption certificates. However, only a maximum of 30% of any fleet's heavy vehicles could be exempted from the ban. Carriers traveling during just one peak could obtain exemptions for 60% of their tractor-trailers. The exemption certificates could cost up to 60$ a truck per year.

The program also would force shippers and receivers with five or more pickups or deliveries a week to stay open at least four hours each work day between 8:00 p.m. and 6:00 am. City agencies would accept deliveries only at night.

First proposed in 1986, the plan has not yet been approved by City Council. Even if approved, the plan likely would encounter legal obstacles. For example, DOT recently ruled that New York City's time-of-day and route restrictions of hazardous materials shipments were inconsistent with federal law. DOT's determination, however, does not have the force of law, and so, until a judge hands down a ruling on the case, the city can continue to restrict such shipments. Other cities are instituting similar bans or restrictions, among them Boston and Houston.

The California Air Resources Board has adopted stringent new state requirements to reduce the sulfur level and aromatics content of diesel fuel. The standard calls for a reduction in sulfur levels to 0.05%, compared with an average of 0.28%. The new limit on aromatics would be set at 10% for most refiners and 20% for small refiners, compared with average levels of 31%. The standards are scheduled to go into effect by October 1993.

A 5% sulfur limit is already in effect in the southern part of the state. The new requirement would extend the 5% sulfur limit to the remainder of the state and add the aromatic content reduction.

The federal EPA has proposed a similar reduction in diesel fuel sul-

fur levels for the country, but the proposal is being opposed by small refiners in the Northeast who claim they can't afford to retool their refineries and will go out of business if they're forced to do so.

In addition, California is expected to start a heavy-duty diesel truck inspection program later this year to identify "gross emitters" of vehicle emissions.

Any truck traveling in the state could be subjected to the inspection. If a truck fails the inspection, it would be taken out of service until fixed. At a minimum, the carrier would have to pay a $300 penalty, which would go into a fund for research to reduce truck emissions.

During a pilot inspection program, 42% of the trucks failed the inspection. The reason for failure was often due to bad fuel injectors or tampering with smoke puff limiters.

California is not the only state that will impact truck operations by means of emissions regulation. Impatience with the government's leniency and slowness to act on the air quality issue have caused several states to take the initiative. For example, a coalition of eight northeastern states, called the Northeast States of Coordinated Air Use Management (NESCAUM), have announced their intention of adopting elements of California's emissions control standards. They have also agreed to reduce gasoline volatility levels during Summer and to require Stage II vapor control nozzles on gasoline pumps.

As part of the initial Clean Air legislation, California was allowed to enact stricter emissions standards because of its particularly serious smog problems. In 1977, Congress amended the law to allow other states to copy the California standards. Until now, none have made such a move.

NESCAUM's plan was jointly developed by the clean-air agencies of Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island and Vermont. Those agencies agreed to adopt California's automobile emission standards, including extending the emissions warranty to 10 years/100,000 miles. Presently, vehicles are required to meet exhaust standards for 50,000 miles. The new standards will raise the price of a typical new car by 1%, or $150, according to NESCAUM.

The NESCAUM proposal must go through a long approval process, including approval by EPA. However, the tougher standards could go into effect, on schedule, with the beginning of the 1993-model year.

The Northeast consortium may be just the first group to act. Other states with air pollution problems are also considering adoption of the California tailpipe standards, and some are considering instituting roadside emissions inspections for heavy-duty vehicles.

For example, a hearing was held

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Don't blow smoke in Colorado

Resident and out-of-state truckers violating emissions rules will face fines of $100 to $1,000 in Colorado effective Jan. 1, 1990.

The new law limits the opacity of a diesel engine's smoke plume to 40% for vehicles operating along the Front Range (all communities between Ft. Collins and Colorado Springs). Opacity is the amount of light obscured by a diesel smoke plume.

Other areas of the state permit 50% opacity for five seconds for trucks with a GVW over 8,000 lb and operated above 7,000-ft elevation.

Diesel trucks that are parked and make a cold start-up are permitted to exceed the limits for 10 minutes.

Fleets registered or principally operated in the Front Range area can opt for a self-certification smoke program if they have nine or more diesel-powered vehicles over 7,500- lb tare weight. Truckers with less than nine units must have their trucks inspected by state stations.

The rule mandates that fleets adhere to an engine-related preventive maintenance program that assures low-smoke levels. At the least, fleets must follow the engine manufacturer's recommended procedures and intervals, and records must be kept to verify compliance.

Trucks that fail the emissions inspection must be repaired to bring them into compliance. For light-duty diesels (less than 7,500-lb tare weight), a minimum of $750 must be spent before the state will issue an opacity waiver. For heavier trucks, a minimum of $1,500 must be spent before a waiver will be issued.

Macie LaMotte Jr., of the mobile sources section, Colorado Dept. of Health, Air Pollution Control Div., Denver, Colo., said the state is gearing up to enforce the new regs. "We are training at least 400 smoke enforcement officers each year. In addition, judges are more knowledgeable about the smoke laws and how to apply them. The City of Denver has a special environmental court to handle violations."

The most restrictive diesel smoke regulations range from 20% to 40% opacity. The cities with those limits include: Arvada, 40%; Aurora, 20%; Boulder, 30%; Denver, 20%; Englewood, 40%; Federal Heights, 20%; Glendale, 20%; Northglenn, 20%; Wheatridge, 40%.

Specific details for all the rules can be obtained from: Colorado Dept. of Health, Air Pollution Control Div., 4210 E. 11th Ave., Denver, Colo. 80220, 303-331-8563/303-331-8592.

The cost of safety and clean air

Implementation of California's safety and clean air programs will raise motor carriers' operating costs by 25% to 69%, according to Luke Sherwood, manager of regulatory programs for the California Trucking Assn.

"Truckers must screen and test their drivers to comply with tougher drivers' license standards and drug testing requirements," says Sherwood. "New regulations dealing with when and where we can travel and what fuels we can burn mean much higher costs. New rules on underground tanks will be implemented as well," he adds. "The trucking industry is moving ahead on being the safest, most environmentally responsible industry in California."

Cost ranges for safety and environmental programs are shown in the following table.

Item	Percentage Cost Increase
Commercial License Enforcement	0.05 – 2.50%
Drug Testing Costs	0.10 – 3.75%
Workers' Comp Reform Costs	1.00 – 6.35%
Off Peak Trucking Costs	5.00 – 14.75%
Additional Training Needs	5.75 – 13.65%
Increased Capital Costs	5.50 – 11.35%
Cleaner Burning Fuel Costs	4.75 – 10.95%
Environmental Compliance	2.75 – 5.40%
TOTAL PUBLIC COST INCREASE	24.90 – 68.70%

recently in Illinois to discuss adoption of the California standards as a means of achieving emissions reductions. The St. Louis and Chicago metropolitan areas have particularly poor air quality.

The process is still in the information-gathering stage, and no formal proposal to adopt California's regulations has been written. Some groups want to wait until the federal government amends the Clean Air Act. Others are urging Illinois to take the initiative.

In November 1987, NESCAUM's states entered into an agreement to reduce the volatility of gasoline sold during the ozone season (Summer). The states decided to act together because of the regional nature of the ozone problem in the Northeast, the large emission reduction benefits available and the slowness of the federal effort to reduce volatility levels.

Since then, each state (except New Hampshire, which plans to require the 9.0 psi RVP standard beginning in 1990) has adopted regulations requiring that gasoline sold between May 1 and September 15, beginning in 1990, have a volatility of 9.0 psi RVP.

Under the Clean Air Act, EPA's reductions in gasoline volatility preempt any state volatility controls, except California's, that are inconsistent with EPA's unless EPA approves the state controls as necessary to achieve air quality standards.

As of January, EPA had approved requests from Massachusetts, Connecticut, New Jersey, New York and Rhode Island. EPA was continuing to review requests from Maine and Vermont. Delaware, Pennsylvania, Maryland and Virginia are also considering requiring lower volatility levels.

In addition, California, which limits the volatility of gasoline sold in the state during the warmer months to 9.0 psi RVP, plans further reductions to 8.0 psi RVP.

Other state actions to reduce emissions involve Stage II vapor recovery nozzles on fuel pumps. Those nozzles have been in use in California and the District of Columbia since the 1970s and, more recently, in St. Louis, Mo., the New York City metropolitan area and New Jersey.

In addition to New York and New Jersey, air quality agencies in the other six NESCAUM states – Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island and Vermont – agreed in October 1988, to recommend adoption of Stage II controls by 1992.

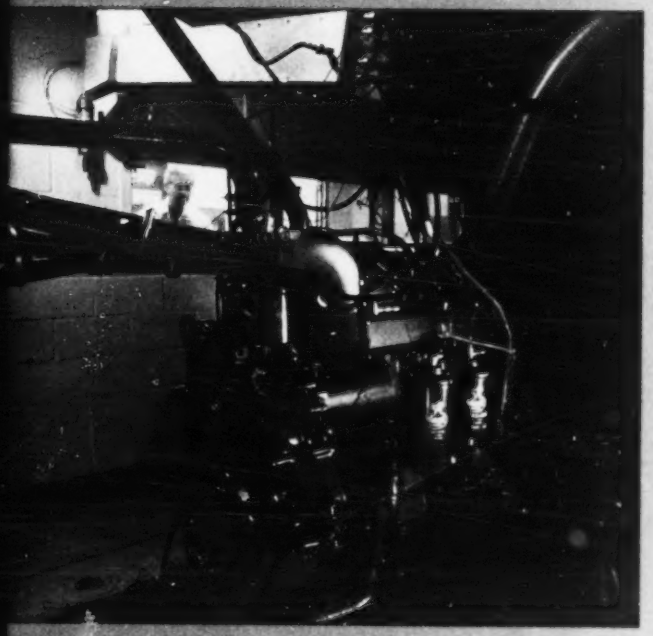
Also, a Stage II control nozzle that is more user-friendly and efficient than current equipment has been certified by the state of California. According to the compliance division chief, the new nozzle would be $200 to $400 more expensive than the current Stage II.

State/local air quality agencies will have more information.

For more information

- *Northeast States for Coordinated Air Use Management (NESCAUM) 85 Merrimac St., Boston, Mass. 02114 617-367-8540*
- *South Coast Air Quality Management District (SCAQMD) 9150 Flair Dr., El Monte, Calif. 91731 818-572-6200*
- *California Air Resources Board PO Box 2815, Sacramento, Calif. 95812 916-322-2990*
- *"EPA's Efforts to Control Gasoline Vapors from Motor Vehicles" (GAO/RCED-90-21) U.S. General Accounting Office, PO Box 6015, Gaithersburg, Md. 20877 202-275-6241.*
- *"The path to clean air: attainment strategies." A summary of the 1989 South Coast Air Quality Management plan. Available from SCAQMD (see address above).*
- *"Catching our breath: next steps for reducing urban ozone." A report from the Office of Technology Assessment. Write: Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402-9325 202-783-3238. Stock No. 052-003-01159-0.* □

DIESEL EMISSIONS: TOO MUCH IN THE AIR



When the EPA's 1991 diesel emissions regulations take effect, fleetmen can expect to see engine design changes. But, except for urban bus applications, the changes will be minor. Tougher regulations will take effect in 1994. And just how engine manufacturers will meet them is unknown.

During normal operation, diesel engines produce potentially harmful substances which are emitted as exhaust. The four that have come under federal regulation are:

(1) Carbon monoxide (CO) is a toxin that, when inhaled in sufficient quantity, inhibits the blood's ability to absorb oxygen. Diesel engines are naturally low producers of CO, and meeting EPA's standard—which stays at 15.5 grams-per-brake-horsepower-hour (g/bhp-hr) from now through 1994—is not viewed as a problem for engine builders.

(2) Hydrocarbons (HC) consist chiefly of unburned fuel. They give diesel exhaust its sharp smell, but are not considered dangerous by themselves, except in extreme concentrations or to people with a specific sensitivity. They are, however a key player in the production of ozone, or photochemical smog. The mandated standard for HC emissions—which will remain 1.3 g/bhp-hr through 1994—has been relatively easy for diesel engine manufacturers to meet.

(3) Oxides of nitrogen (NOx) are oxidants, extremely irritating to human and animal lung tissue. Mix NOx with HC emissions, add sunlight, and you've got ozone. Ozone is even more irritating than raw NOx, and can cause permanent lung damage. When combined with sulfurous combustion byproducts, NOx emissions also play a part in the formation of acid rain.

For 1991, the EPA standard for NOx drops from the present 6.0 g/bhp-hr to 5.0 g/bhp-hr, where it will remain through 1994. This, in combination with future standards for particulates, will be troublesome for engine makers, especially in 1994.

(4) Particulate matter (PM) is the most visible pollutant, also known as soot. Particulates are minute bits of carbon and sulfurous compounds formed by incomplete combustion of fuel and lubricating oil. Recently labeled by OSHA as a "potential carcinogen," about 30% of diesel particulate emissions are directly related to fuel sulfur content (see companion story in this issue, *The health effects of diesel smoke*).

1991 regulations for heavy trucks reduce the allowable amount of PM from the current .60 g/bhp-hr to .25 g/bhp-hr. In 1994, the level must again be chopped by more than half, to .10 g/bhp-hr. For intracity buses, the level drops from .60 g/bhp-hr to .10 g/bhp-hr in 1991. In other words, urban buses must meet 1994 PM regulations in 1991.

Continued

HEAVY—DUTY TRUCK ENGINE EMISSION STANDARDS

(g/bhp-hr measured during EPA heavy-duty engine test)

Model Year	NOx	HC	CO	PM
1988	10.7	1.3	15.5	0.60
1990	6.0	1.3	15.5	0.60
1991	5.0	1.3	15.5	0.25
1994	5.0	1.3	15.5	0.10

URBAN BUS HEAVY—DUTY ENGINE EMISSION STANDARDS

(g/bhp-hr measured during EPA heavy-duty engine test)

Model Year	NOx	HC	CO	PM
1988	10.7	1.3	15.5	0.60
1990	6.0	1.3	15.5	0.60
1991	5.0	1.3	15.5	0.10
1994	5.0	1.3	15.5	0.10

Playing the game

EPA requirements pose a challenge because PM and NOx sit on opposite ends of a seesaw—as one goes down, the other goes up. For example, one way to lower NOx is to retard injection timing. This lowers combustion temperatures and inhibits NOx production. However, lower combustion temperatures don't burn fuel as efficiently, and PM emissions increase.

Since approximately one-third of PM emissions are byproducts of fuel sulfur, a quick and painless way (at least for engine builders) to reduce PM emissions is to use low-sulfur fuel. Current diesel fuel sulfur levels in the U.S. are a little less than .3%. If pending legislation is approved, fuel with a maximum of .05% sulfur will be the rule, nationwide, by late in 1993.

Diesel engine manufacturers would like to use low-sulfur fuel now, to certify their engines' emission levels with EPA, and it looks like they'll be allowed to. "We're in rulemaking now," says John Anderson, senior EPA program manager. "We expect to be finished soon. Low-sulfur fuel will probably come about, despite opposition from some smaller refineries and distributors, who say they can't afford the equipment investment. It is our intention to allow engine makers to use low-sulfur fuel to certify for 1991."

The good news is, even without low-sulfur fuel, most of the engines available today will continue to be offered through 1993, with relatively minor modifications.

"Essentially, the engines we're offering in 1990 will be available in 1991," says John Piasecki, assistant division manager, product development, Caterpillar Engine Div., Peoria, Ill., "with the possible exception of the 3208, which is being phased-out."

Even nonconformance with 1991 emissions standards may not prohibit the sale of a given engine, since EPA intends to permit:

- payment of nonconformance penalties, unless an engine is exceptionally dirty;
- emissions averaging—looking at the average emission levels of all of a company's engines. If the average meets the standard, individual models that don't measure up could continue to be sold. The average could also include engines using cleaner-burning alternative fuels;
- emission credit trading—like averaging, but between specific engine models. Credits earned by an engine that beats the standards are traded to one that can't meet them;
- emission credit banking—storing credits earned during the years a particular engine beat the existing standards, and applying them to the same engine in order to keep selling it in years when it can no longer meet the standards. This, according to Cat's Piasecki, is what may enable the company to continue to offer the 3208, mostly to the RV market, in 1991.

"We need this kind of flexibility," says Dave Merrion, senior vice president-engineering for Detroit Diesel Corp., Detroit, Mich. "If we can't have it, and if we can't use low-sulfur fuel to certify, we may lose a couple of engines in '91."

'91 engine changes

Generally, hardware changes to look for in '91 include expanded use of air-to-air aftercooling and various improvements in turbos, combustion chambers and pistons. In many cases, injection pressures will be increased.

"Our injection pressures will be up about 10%," comments Jeff Jones, director of automotive support, Cummins Engine Co., Columbus, Ind. "And we'll continue to offer mechanical and PACE electronic injection systems. We'll also introduce a new, electronically-controlled, unit injection system, called ECI, in mid-1990.

"Look for modest horsepower increases, pretty much throughout the line," adds Jones. "Our goal has been to meet the standards while improving performance." Although there's no official word, OEMs indicate that Cummins will abandon its air-to-water, Optimized Aftercooling setup in favor of air-to-air.

Tighter and more durable piston rings, valve guides and turbocharger seals also will be evident in 1991, because slashing consumption of engine oil is another way to reduce PM emissions. Tighter-top-land and higher-top-ring configurations can boost oil control while reducing upper-piston-to-cylinder dead space, where unburned fuel likes to hide.

"We're going to low-crevice-volume (LCV) pistons on our 3406 models," says Cat's Piasecki, "along with a newly-designed fuel cam to reduce PM emissions."

Cat's general approach, he says, has been to increase injection and cylinder pressures for some ratings, and to improve breathability throughout the line. "The electronically-controlled, unit-injected 3176 requires very little modification," he notes. "A few minor changes to electronic fuel maps, turbos and injector nozzles, and we're ready."

Cat's 3176 and 3406 engines both will benefit from lower-inertia turbochargers, which provide more boost at lower rpm. Two new ratings – 350 hp for the 3176, and 460 hp for the 3406B PEEC (Programmable Electronic Engine Control) – are tentatively scheduled.

"Our Series 60, four-stroke engines will get higher top-ring pistons," says DDC's Merrion. "Apart from that, they'll require very little modification, thanks to our DDEC (Detroit Diesel Electronic Control) system. Operators may even see a slight increase in fuel economy in the 12.7-liter engine which, by the way, we'll probably offer in new 425-hp and 450-hp versions.

"The two-stroke engines also will get higher top piston rings," he continues, "along with some turbo-tuning, and higher compression ratios and injection pressures. Also, DDEC will be standard on 71 and 92 Series engines. Unlike the Series 60 engines, however, the two-strokes will suffer a small drop in fuel economy as a result of the changes."

Meanwhile at Mack, the venerable E6 engine will be retired for '91, and the E7, fitted with electronically-controlled injection timing, will be offered in horsepower ratings of 250, 300, 350 and 400. "We're moving the E7's top rings higher," says Frank Pekar, Mack's director of powertrain engineering, "as well as going to lower-inertia turbos, new injector nozzles and 10% higher injection pressures. Most importantly, we want to maintain driveability. We want the changes to be as transparent as possible."

"We're doing many of the things that have become standard in the industry," says Bob Turney, executive engineer, Ford's Diesel Engineering Div., Troy, Mich. "We've modified the fuel-delivery profile, retarded injection timing a bit, and offset that with higher compression ratios and injection pressures. We've also gone to pistons with reentrant chambers, and we're paying lots of attention to oil consumption control."

According to Turney, Ford's 7.8-liter engine will be available in all current ratings, from 170 hp to 270 hp, with the addition of a 2000-rpm, Econo-Torque 215-hp version. Thanks to reductions in rated rpm, fuel economy is not expected to suffer.

For '91, Ford will not use electronic controls, but still will be able to certify its engines on .2%-sulfur fuel – a requirement for sale of its engines in California.

Traps and more in '94

If any engines are discontinued (for domestic production or importation), it most likely will be in 1994 because: extensive re-engineering required for compliance may not be cost-effective; a progressive increase in nonconformance penalties could be intolerable; closely-competitive models may require less-costly exhaust after-treatment devices and/or prove substantially more fuel-efficient.

Based on current technology, it appears that all diesels produced in 1994 will need electronic injection controls and some form of exhaust after-treatment to trap or alter PM emissions.

Effectively trapping soot is easy. But once it's trapped, it's got to be disposed of. Otherwise, it will clog the trap and shut the engine down.

One feasible after-treatment option for 1994 is a simple soot trap, resembling a conventional muffler, that relies solely upon exhaust heat to periodically or continuously destroy the particulate matter it collects. Akin to a self-cleaning oven, this type of trap uses a catalytically-coated filter medium to reduce the temperature required for oxidizing soot. Engineers refer to the self-cleaning process as regeneration.

Low-sulfur fuel must be used with catalytic traps, because the traps can increase the conversion of fuel sulfur to sulfate particulate. In turn, the rate of sulfate build-up within catalyzed traps would increase and hinder regeneration.

Predictably, catalytic traps are best-suited to over-the-road applications where reasonably high exhaust temperatures are likely to be maintained. They're literally not so hot for short hauls where exhaust temperatures tend to vary. Ultimately, the solution by 1994 may be a method of making engines run hotter during periodic regeneration.

Engines could be switched, for example, from aftercooled to non-aftercooled operation to help increase exhaust temperature during trap regeneration. An aftercooler bypass system is already in use on Volvo 7- and 12-liter engines in the U.S. to avoid overcooling while going downhill, and to reduce white smoke at idle in cold ambients.

A threat is posed by the tendency of metallic ash from engine oil to

Continued

Particulate trap substrate, plugged by soot and metallic ash. For traps to work, low-sulfur fuel, improved oil control and low-ash oil formulations will be necessary.

coat the inside of catalytic traps, and refuse to be purged during regeneration. As a result, traps may become partially plugged with metallic ash within 100,000 miles of operation. For that reason, diesel engine oils will be reformulated in the 1990s to reduce the content of ash-forming additives. This could prove tricky, because some types of ash have a lubrication quality that helps to reduce bore polishing in certain engines.

A more complex soot trap, without a catalyst, is another option for '94 exhaust after-treatment. This is not dependent on exhaust heat for regeneration, but on additional heat from in-trap fuel combustion, or from an electrical heat source. During regeneration, exhaust is bypassed around the trap to prevent overheating.

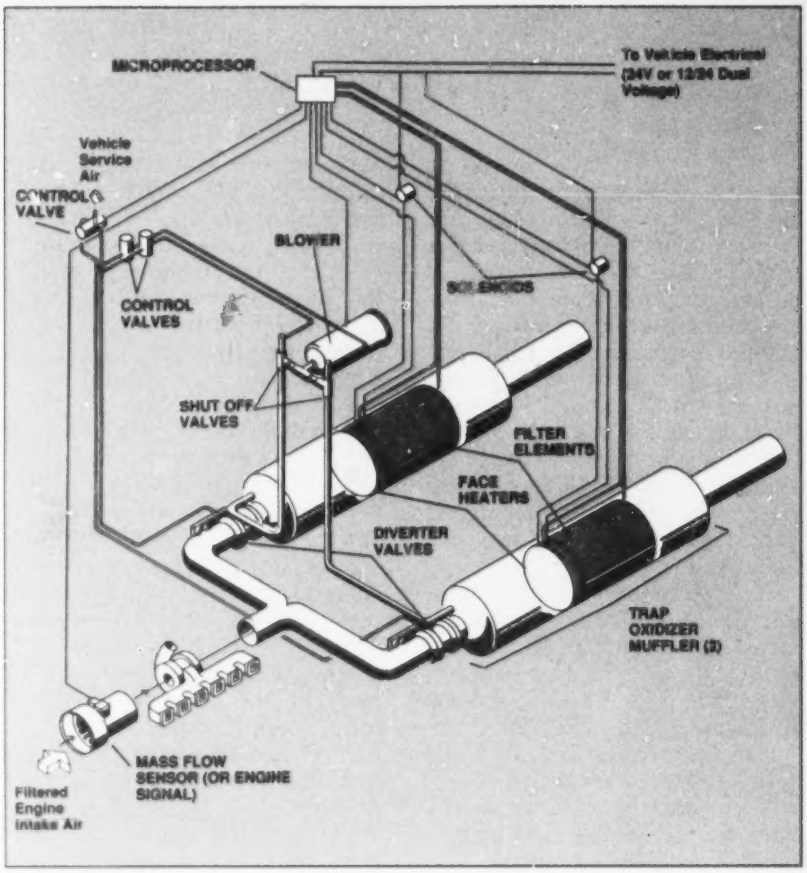
An electrically-heated, regenerative trap, developed by Donaldson Co., Minneapolis, Minn., is to be tested on 400 buses in New York City next year. By 1994, there should be plenty of useful data on the trap's performance.

Again, low-sulfur fuel is a prerequisite to the use of these noncatalytic, regenerative traps, because they filter-out 90% or more of the carbon soot but permit most sulfur-derived particulates to pass.

The least costly and most reliable option may prove to be a flow-through catalytic converter, like the ones used on the 94 Smokeless Diesel prototype, recently demonstrated by Navistar International, Chicago, Ill.

The Smokeless Diesel is based on a DT 466, 210-hp, in-line six. Ultra-high injection pressures, a reentrant chamber atop each piston, and – you guessed it – low-sulfur fuel, allowed Navistar engineers to route the exhaust through a pair of relatively simple catalytic converters.

Thus arranged, the prototype engine was able to beat 1994 emission standards for heavy-duty diesel engines, as well as those for heavy-duty methanol engines. The only remaining hurdle is durability. EPA says the converter must be capable of going 150,000 miles without a failure. So far, durability has only been demonstrated to 50,000 miles.



Regenerative, noncatalytic particulate trap by Donaldson is actually two traps that take turns – one gathers particulates while the other incinerates particulates already collected.

The urban bus and alternative fuels

For 1991, EPA insists that diesels in urban buses – perceived as mobile smoke stacks by the public – must comply with 1994 emissions standards for heavy trucks. Problem is, the exhaust after-treatment devices needed for 1994 probably won't be ready in 1991. If they are not, any urban buses sold in 1991 through 1993 will have to be powered by cleaner, alternative-fuel engines.

Methanol, or wood alcohol, is the most likely contender, by virtue of its low output of particulate matter during combustion. But there are other considerations. First, methanol doesn't ignite readily under compression. So, to burn the stuff in a diesel engine, you've got to either add an ignition system or treat the methanol with an ignition improver – either option driving up costs.

Then there's the matter of energy content. Since methanol offers roughly half the Btu's of diesel, operators will have to carry twice as much fuel – on board, which would reduce passenger-carrying capacity, and in storage tanks, which must be modified to accept this more corrosive fuel.

Unlike diesel fuel, methanol is far from a lubricant. Therefore, it's tougher on rings, pistons and liners, unless a lubricant is added.

Finally, there are safety concerns. One is that methanol burns with a pale blue flame that's all but invisible in daylight, making a methanol fire hard to spot. Another is that methanol produces formaldehyde – a suspected carcinogen – when it burns. Finally, methanol can be fatally toxic, yet dissolves completely in water. In the event of an underground storage tank leak, methanol would be

difficult to detect in ground water.

Compressed natural gas (CNG) and liquefied petroleum gas (LPG) are other possible, cleaner-burning alternatives. And they have long been employed by utility fleets using commercially-available gasoline-engine retrofit kits.

Ethanol, or ethyl alcohol, is yet another option. And hybrid systems, involving various mixtures of liquid and gaseous fuels, are also being tested.

But ethanol, CNG, LPG and hybrids all suffer, to some degree, from the same disadvantages as methanol, compared with diesel – less energy output and/or special handling and safety considerations.

Which is not to say that these problems couldn't be overcome, or at least dealt with for the sake of the environment. But, since it's expected that diesel-powered urban buses will return as particulate-control technology ripens, there's little financial incentive to iron out alternative fuel wrinkles. Operators of urban bus fleets aren't anxious to spend small fortunes for extra-cost on-board tanks and dispensing facilities required to handle special fuels on an interim basis.

Based on an American Public Transit Association survey, sales of urban buses may be almost non-existent between 1991 and 1993. Many urban bus fleetmen say they will stockpile new equipment in 1990 and/or keep older equipment running until 1994.

The irony here is that the older the bus, the more smoke it's likely to produce. On that basis, EPA's plans for regulating urban buses may prove significantly counter-productive, not just ineffective.

Regardless of domestic sales projections that threaten to approach zero, engine makers are geared up to provide some alternative-fueled diesels in 1991. Detroit Diesel will offer V-6 Series 92 and in-line Series 671 engines burning 100% methanol. L-10 diesels from Cummins will offer a choice of CNG or methanol with an additive package. And Caterpillar is testing a 3406B methanol engine.

Yet to be fully determined is the impact of a congressionally-sponsored, multi-million-dollar program to promote alternative- and dual-fueled engines in vehicles ranging from cars to heavy-duty trucks and buses.

In part, this program authorizes the U.S. Department of Energy (DOE) to work with states in developing demonstration and evaluation programs.

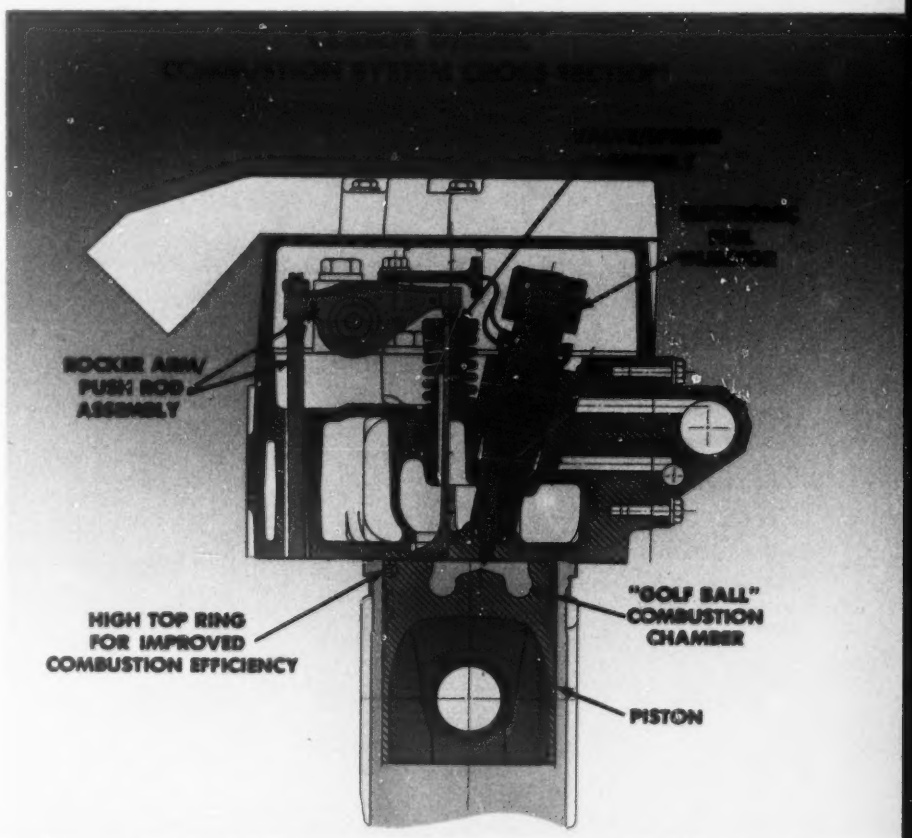
In addition, local mandates for fleet use of alternative fuels are likely to increase, due to ever-increasing public concern about health risks associated with emissions-related smog. California's South Coast Air Quality Management District already is moving toward implementation of its Fleet Clean Fuels Rule. By 1993, the rule proposes that new engines purchased by fleets of 15 or more vehicles must be capable of operating on alternative fuels.

For more information:

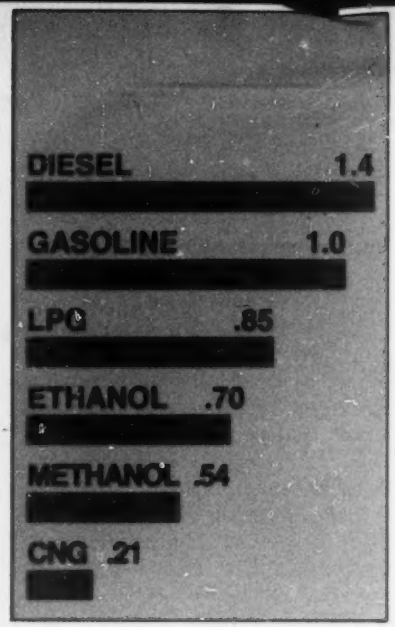
SAE Technical Papers available from Society of Automotive Engineers, 400 Commonwealth Dr., Warrendale, Pa. 15096.

• *Ecklund, Nichols and S. and N. Sefer. "Options for the Introduction of Methanol as a Transportation Fuel." SAE International Fuels and Lubricants Meeting and Exposition, Toronto, Ontario, Nov. 2-5, 1987.*

Continued



Navistar's planned, production Smokeless Diesel – based on the DT 466 @ 210 hp – uses ultra-high-pressure, electronically-controlled unit injectors. Note piston re-entrant chamber and location of upper rings. A single, flow-through catalytic converter, say Navistar officials, will allow the engine to beat 1994 emissions regulations.



Approximate energy content index for various fuels. Gasoline is baseline at 1.0. Alternative fuels, compared with diesel or gasoline, have less energy content and deliver fewer miles per gallon.

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• *Richards and Sibley. "Diesel Engine Emissions Control for the 1990s." SAE International Congress and Exposition, Detroit, Mich., Feb. 29-Mar. 4, 1988.*

• *Kidd and Kreeb. "Conversion of a Two-Stroke Diesel Bus Engine to Methanol Fuel." SAE Truck and Bus Meeting & Exposition, Dearborn, Mich., Dec. 3-6, 1984.*

• *Dowd, Holmes and McNutt. "The Cost of Making Methanol Available to a National Market." SAE International Fuels and Lubricants Meeting and Exposition, Toronto, Ontario, Nov. 2-5, 1987.*

• *Yumlu. "Particulate Traps: Some Progress; Some Problems." SAE International Congress and Exposition, Detroit, Mich. Feb. 29-Mar. 4, 1988.*

• *Baranescu. "Influence of Fuel Sulfur on Diesel Particulate Emissions." SAE Future Transportation Technology Conference and Exposition, San Francisco, Calif., Aug. 8-11, 1988.*

• *"Analysis of the Economic and Environmental Effects of Methanol as an Automotive Fuel." U.S. Environmental Protection Agency, Washington, D.C. 20460.*

• *Bol and King. "Methanol Powered Transit Buses In Canadian Fleet Services." Sypher: Mueller International Inc., Ottawa, Canada.*

• *"Milestone." Sypher: Muller International Inc., Ottawa, Canada.*

• *"Regulation of Fuels and Fuel Additives; Fuel Quality Regulations for Highway Diesel Fuel Sold in 1993 and Later Calendar Years." American Trucking Associations, 2200 Mill Rd., Arlington, Va. 22314.*

• *"Catching our Breath. Next Step for Reducing Urban Ozone." Congress of the United States, Office of Technology Assessment, Washington, D.C. 20510-8025.*

• *"A Side-by-Side Comparison of Studies Concerning Alternative Vehicle Fuels." American Gas Assn., 1515 Wilson Blvd., Arlington, Va. 22209.*

• *"Air Quality Benefits of Alternative Fuels." Office of Mobile Sources, Office of Air and Radiation, U.S. Environmental Protection Agency, Washington, D.C. 20460.* □

BUYER'S GUIDE

Diesel Engines

Caterpillar Inc
Engine Div
PO Box 610 Mossville IL
61552-0610
Circle 400 on Reply Card

Cummins Engine Co Inc
PO Box 3005 Columbus IN
47202-3005
Circle 401 on Reply Card

Detroit Diesel Corp
13400 Outer Dr Detroit MI
48239
Circle 402 on Reply Card

Ford Motor Co
Truck Operations
PO Box 43308-A Detroit MI
48243
Circle 403 on Reply Card

Freightliner/Mercedes
PO Box 3849 Portland OR
97208
Circle 404 on Reply Card

Hino Diesel Truck (USA) Inc
12 Ramland Rd Orangeburt
NY 10962
Circle 405 on Reply Card

Isuzu Truck of America
1180 S Durfee S El Monte
CA 91733
Circle 406 on Reply Card

Iveco Trucks of North America
PO Box 1102 Blue Bell PA
19422
Circle 407 on Reply Card

Mack Trucks Inc
Box M 2100 Mack Blvd
Allentown PA 18105
Circle 408 on Reply Card

Mitsubishi Fuso Truck of America Inc
100 Center Sq Pureland Ind
Park Bridgeport NJ 08014
Circle 409 on Reply Card

Navistar International Transportation Corp
401 N Michigan Ave Chicago
IL 60611
Circle 410 on Reply Card

Nissan Diesel America Inc
PO Box 152034 Irving TX
75015
Circle 411 on Reply Card

Saab-Scania of America
Scania Truck Div
Orange CT 06477
Circle 412 on Reply Card

Volvo White
PO Box 26115 Greensboro
NC 27402-6115
Circle 413 on Reply Card

Carburetors/Converters LP/Natural Gas

Acme Carburetion Inc
Hi-Way 169 N Mankato MN
56001
Circle 414 on Reply Card

Amerigas LP-Gas Div
500 N Gulph Rd King of
Prussia PA 19406
Circle 415 on Reply Card

FVC Corp
300 N. York Houston TX
77003
Circle 416 on Reply Card

Facet Fuel Systems Inc
1048 Industrial Park Rd
Bristol VA 24201
Circle 417 on Reply Card

Home Gas Corp
PO Box 480 Great Barrington
MA 01230
Circle 418 on Reply Card

IMPCO Carburetion Inc
16804 Gridley Pl Cerritos CA
90701
Circle 419 on Reply Card

LE Klein Co Inc
2914 Reward Lane Dallas TX
75220
Circle 420 on Reply Card

LPF Carburetion Inc
PO Box 100 Hutchinson KS
67501
Circle 421 on Reply Card

Petrolane LP-Gas
PO Box 1410 Long Beach CA
90801
Circle 422 on Reply Card

Circle 25 on Reply Card for More Data